ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
AND
ASTROBOTIC TECHNOLOGY, INC
UNDER
SPACE ACT UMBRELLA AGREEMENT NO. SAA8-1930516
ANNEX NO. SAA8-1930516.2

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of providing unique NASA/MSFC expertise for modeling propellant and pressure feed system dynamic transients for the Astrobotic's Peregrine robotic cargo lunar lander propulsion feed system by adapting the Easy5 Advanced Controls & Systems Simulation computer software tool. The initial design and development of the Astrobotic Peregrine lunar lander was started under the now completed NASA Lunar Cargo Transportation and Landing by Soft Touchdown (Lunar CATALYST) initiative. This reimbursable Annex is the next logical step under currently active Commercial Lunar Payload Services (CLPS) initiative to support the continued progress of the propulsion design though analytical design and system testing.

ARTICLE 2. RESPONSIBILITIES

A. NASA MSFC will use reasonable efforts to:

1. Support the initial kick-off meeting for the purpose of establishing the initial point of departure, goals, and objectives for analysis and testing of the Peregrine propulsion feed system based initial mission plans, technical data, and study requirements provided by Partner.
2. Support weekly tag-up meetings for communicating project status and information.
3. Support quarterly technical interchange meetings (i.e., TIM-1, TIM-2 TIM-3, and TIM-4) to formally address the design analysis cycle (DAC) including the next phase of analytical design and system testing.
4. Using the Easy5 software tool, initially develop and continue to refine an analytical model of the Peregrine propulsion feed system that correlates with the results of system testing.
5. As needed, support (via guidance and collaboration) Partner's development and refinement of its Easy5 analytical model of the Peregrine propulsion feed system.
6. Perform all system testing (i.e.,cold flow tests) as needed to support the analytical design of the Peregrine propulsion feed system and immediately provide test results (in .csv or .sun format) to Partner (cost estimate is based on approximately 25 test runs).

7. Provide PowerPoint presentation summary of all MSFC analytical results within 30 business days of completed analysis.
8. Support additional meetings as needed to address specific issues/questions related to the analytical design or system testing of the Peregrine propulsion feed system
9. Provide final report.

B. Partner will use reasonable efforts to:

1. Provide initial mission plans, technical data, and study requirements related to the Peregrine propulsion feed system.
2. Schedule and conduct a kick-off meeting for the purpose of establishing the initial point of departure, goals, and objectives for analysis and testing of the Peregrine propulsion feed system.
3. Schedule and conduct weekly tag-up meetings for communicating project status and information.
4. Schedule and conduct quarterly technical interchange meetings (i.e., TIM-1, TIM-2 TIM-3, and TIM-4) to formally address the design analysis cycle (DAC) including the next phase of analytical design and system testing.
5. Using the Easy5 software tool, initially develop and continue to refine an analytical model of the Peregrine propulsion feed system that will correlate with both the MSFC-developed Easy5 analytical model and the results of system testing.
6. Perform studies and analysis recommended by NASA MSFC.
7. Schedule additional meetings as needed to address specific issues/questions related to the analytical design or system testing of the Peregrine propulsion feed system.

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

Kickoff meeting	Within 10 business days of effective date.
First quarterly TIM-1	Effective date + 3 months
Mid-term review/second quarterly TIM-2	Effective date + 6 months

Third quarterly TIM-3	Effective date + 9 months
Final report.	Effective date + 12 months

ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated cost of $598,555 for NASA to carry out its responsibilities under this Annex. Each payment shall be marked with MSFC SAA8-1930516.2.
Payment Distribution:
1st payment: $297,781 Due at contract start
Mid-term review/second quarterly TIM-2
2nd payment: $169,307 due November 1, 2020
Third quarterly TIM-3
3rd payment: $131,467 due February 1, 2021

B. NASA will not provide services or incur costs beyond the existing payment. Although NASA has made a good faith effort to accurately estimate its costs, it is understood that NASA provides no assurance that the proposed effort under this Agreement will be accomplished for the above-estimated amount. Should the effort cost more than the estimate, Partner will be advised by NASA as soon as possible. Partner shall pay all costs incurred and has the option of canceling the remaining effort or providing additional funding in order to continue the proposed effort under the revised estimate. Should this Agreement be terminated, or the effort completed at a cost less than the agreed-to estimated cost, NASA shall account for any unspent funds within one year after completion of all effort under this Agreement, and promptly thereafter return any unspent funds to Partner. Return of unspent funds will be processed via Electronic Funds Transfer (EFT) in accordance with 31 C.F.R. Part 208 and, upon request by NASA, Partner agrees to complete the Automated Clearing House (ACH) Vendor/Miscellaneous Payment Enrollment Form (SF 3881).

ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of three years.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.
1. Background Data:
None

2. Third Party Proprietary Data:
None
3. Controlled Government Data:
None
4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement:
None

ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or one year from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

Technical Points of Contact

NASA George C. Marshall Space Flight Center
Jack Chapman
AST, LIQUID PROPULSION SYSTEMS
Marshall Space Flight Center, AL 35812
Phone: 256-544-9366
jack.m.chapman@nasa.gov

ASTROBOTIC TECHNOLOGY, INC
Sharad Bhaskaran
Mission Director
912 Fort Duquesne Blvd, Third Floor
Pittsburgh, PA 15222-4613
Phone: 650-421-6423
sharad.bhaskaran@astobotics.com

ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER	ASTROBOTIC TECHNOLOGY, INC
BY: NELSON PARKER Digitally signed by NELSON PARKER Date: 2020.06.04 16:07:38 -05'00'	BY:
Joe L Leopard	John Thornton
Director Engineering Directorate	CEO, Astrobotic Technology, Inc.
DATE:	DATE: 6/3/2020